

# ESAS 1110 – Introduction to Meteorology

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## Topical Outline

Text: Meteorology by Ackerman and Knox – 3<sup>rd</sup> Edition

### UNIT I

- $P=\rho RT$ : FUNDAMENTAL BEHAVIOR OF THE AIR  
Charles' Law; Boyle's Law; The Ideal Gas Law; Adiabatic Processes

#### **Math Lab Part 1**

- HEAT AND TEMPERATURE
- ADIABATIC PROCESSES – GETTING READY FOR THE RAIN  
Lapse Rates
- STRUCTURE OF THE ATMOSPHERE  
Layers; Chemical Constituents; Importance of Gases; Meteors

#### **Geography Lab**

- WEATHER INSTRUMENTS
- STATION MODELS  
Symbols and Meanings
- ENVIRONMENTAL ISSUES AND CONCERNS  
The Greenhouse Effect; Global Warming; The Ozone Problem

#### **Test I**

#### **Geography Quiz**

## **UNIT II**

- WATER IN THE ATMOSPHERE – "PROVE IT!"  
Relative Humidity; Mixing Ratio; Dew Point; Wet Bulb; Vapor Pressure
- WATER ON THE EARTH – "IF YOU SEE IT, ITS A LIQUID!"  
Floods; Fog; Steam
- CLOUD PHYSICS – "EVERYTHING YOU ALWAYS WANTED TO KNOW..."  
Types; Collision and Coalescence; The Bergeron Process
- STABILITY AND INSTABILITY – LEARNING TO LIFT A PARCEL  
Parcel Method; Judging the Atmosphere's Stability; LCL; LFC; EL

### **Instability Lab**

- LIFE CYCLE OF A GARDEN VARIETY THUNDERSTORM  
Development; Frozen Precipitation

### **Test II**

## **UNIT III**

### **Math Lab Part 2**

- ELECTROMAGNETIC RADIATION – "WHAT IS THE CAUSE OF THE WEATHER?"  
 $c = \lambda \cdot f$ ; Electromagnetic Spectrum
- THE SUN – "HOW HOT IS HOT?"  
Physical Properties; Temperature
- BLACKBODY RADIATION  
Wien's Displacement Law; Stefan–Boltzmann Law

- VARIABILITY OF INCOMING SOLAR RADIATION – "WHAT CAUSES THE SEASONS?"  
Seasons; Orbit; Temperature vs. Length of Day

### **Climate Lab**

- RADIATION AND THE EARTH-ATMOSPHERE SYSTEM – "WHY IS THE SKY BLUE?"  
Absorption; Reflectivity; Scattering;
- RADIATION BUDGET – "WHEN WATER VAPOR CONDENSES..."  
Conduction and Convection
- GENERAL CIRCULATION – REDEFINING THE WEATHER  
Hadley Cell; Three-Cell Model; ITCZ

### **Test III**

## **UNIT IV**

- FORCES OF MOTION – "NEWTON WAS A WEATHERMAN?"  
Gravity, PGF, Coriolis Force, Centrifugal Force, Friction
- FORCES AND WINDS – DEVELOPING AN UNDERSTANDING OF THE JET STREAM  
Geostrophic; Gradient; Surface; Hydrostatic Equation
- SEA AND LAND BREEZES – LEARNING TO FORECAST IN FLORIDA DURING JULY  
Time and Size Scales; Mesoscale Circulations

### **Physics Quiz**

- AIR MASSES AND FRONTS – "DON'T EVEN THINK ABOUT SAYING 'LOW!'"  
Identification and Modification; Finding Fronts; Types; Cross-Sections;  
Associated Weather

### **Cyclone and Isoplething Lab**

- LIFE CYCLE OF A WAVE CYCLONE – THIS IS A WEATHER MAP!  
Baroclinity; Cyclogenesis; Frontogenesis; Associated Weather
  
- THUNDERSTORMS AND SEVERE WEATHER – LOADING THE GUN  
Squalls; Convective Instability; Multicell and Supercell Storms
  
- SURVIVING AND UNDERSTANDING SEVERE WEATHER  
Lightning; Tornadoes; Safety
  
- HURRICANES AND TROPICAL STORMS  
Formation; Safety; Conservation of Angular Momentum

#### **Test IV**

#### **Cumulative Final Exam**